CLINICAL INVESTIGATIONS OF THE DIGESTION IN THE INSANE:

A CONTRIBUTION TO THE STUDY OF THE NEUROSES OF THE STOMACH, WITH SPECIAL REFERENCE TO HYPERACIDITY AND BITS OF MUCOSA FOUND IN THE STOMACH WASHINGS.

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The following pages record the results of a series of investigations upon the work of the digestive glands in the insane conducted at the Michigan Asylum for the Insane at Kalamazoo, Dr. William M. Edwards, Medical Superintendent. The work was begun in the spring of 1900. A short and very incomplete report of the earliest part was published in the *Proceedings of the Michigan State Medical Society* of 1900, and the *Physician and Surgeon* of the same year. Because of other pressing duties, it was impossible for us to devote our time exclusively to this study, accordingly a number of the reports are not as complete as we would wish and the work has been drawn out over a considerable length of time. This extension of time, however, has been of distinct advantage in a few instances, as it has enabled us to gain a better idea of the more or less constant condition of the secretions of the gastric glands.

The suggestion for our work was received from von Noorden's article, "Stitungsbericht der medicin Gesellschaft zu Giessen," published in the *Archiv für Psychiatrie und Nervenkrankheiten,* Band xvii., 1887. As a somewhat careful search through the literature failed to disclose any verification of von Noorden's work, we came to the conclusion that should we attempt to duplicate his researches so far as possible for purpose of comparison, we would not be forcing an entirely unnecessary investigation upon the medical journal and its readers. It would be difficult to improve upon the manner in which von Noorden conducted his researches; our report differs from his in only a few details, and these we will indicate as we go along.

It goes without saying that the neuroses of the stomach are encountered more frequently than any other group of stomach diseases, at least in America. Indeed, it is to be questioned whether we do not encounter an associated neurosis of some kind in a large percentage of the true organic diseases of the stomach, such as chronic gastritis, peptic ulcer, and dilatation. It is impossible to multiply too many facts concerning the neuroses, and we trust that others will take up the work where we have left off, improve upon it, and investigate the condition of the stomach functions in other mental states. Work of this character can be carried on much better by someone who resides at an asylum, where his patients are constantly under his control and observation. The asylums owe a debt to the profession in this particular. Cases should be studied more carefully than we have been permitted to do. The relation of appetite to the secretions, the effect of changing mental states upon the secretions and functions, the postmortem findings, and especially the study of the gastric mucosa—which has been preserved by filling the stomach with formalin solution immediately after death—should be investigated. The mucosa in particular offers a promising field for research. In no other field of medicine is there such a dearth of pathological knowledge as in insanity. Lastly and very important is the psychological study of these peculiar phenomena of digestion. This we do not attempt, but leave it for those who, by special training, are better fitted for this task.

The writers are greatly indebted to Dr. William M. Edwards, Medical Superintendent of the asylum, for placing at their disposal the patients and laboratories of the institution. To Drs. Inch and Barrett, as well as to Dr. Cowie's former assistant, Dr. Ralston Williams, acknowledgment is also due for valuable services.

HISTORICAL. *A Brief Résumé of the Investigations that have Been Made on the Secretions in the Insane.* So far as the subject of this contribution is concerned, the history is a brief one. We have only to go back eighteen years for the older ideas concerning the secretions of the stomach in melancholia. Until this time alienists were content to consider the various gastric symptoms complained of by melancholiacs, and they are many, to be due to a gastric catarrh or nervous dyspepsia, and that the loss of appetite and its consequent symptoms were due to a diminished secretion of the gastric juice. Naturally from such reasoning, hydrochloric acid and pepsin were extensively used in the treatment of these cases.

For some reason von Noorden's work seems to have been overlooked by alienists in general. A perusal of the more popular works on insanity would at least lead one to this conclusion, as no mention is made of this valuable acquisition to medical science. When, on the other hand, we turn our attention to the domain of internal medicine, we find that, particularly in those works devoted more or less exclusively to diseases of the digestive apparatus, von Noorden's researches in this field are well known and frequently quoted.

The study of the urine in the insane has been considerable. Bondurant may be said to be foremost among those who claim that albuminuria is of frequent occurrence in the insane, independent of morbid histological changes in the kidneys. In a large number of these cases the albumin was detected by tests that are far more delicate than those employed in the usual urine examinations, and it has been claimed that control experiments upon normal urines have not been sufficiently conducted. It is thought by some that the albuminuria in the insane is similar to that which can be induced experimentally. Albumosuria is thought by Pilcz to be of more or less constant occurrence in mania, and peptonuria, glycosuria, and acetonuria are thought by others to have some bearing on the insane state. Just what all these various phenomena mean is certainly thus far by no means comprehensively explained, and little, if any, practical value has been derived therefrom.

The study of the effect of the so-called autointoxications which are brought about by the absorption of ptomaines and leukomaines resultant upon the improper splitting up of albuminous substances in the intestinal canal has received the attention of a number of investigators. Experiments have been conducted, the object of which has been to test the effect of the injection into animals of urine and stomach contents from the insane and from cases of autointoxication. The toxicity of the material injected is thus estimated. Toxic substances in the blood of the insane have been demonstrated by Naegeli and his followers by a reaction which occurs when certain algæ (spiro-gyra) are placed in diluted blood; but little if any importance has been attached to this, as in all disease states more or less toxic substance is being constantly carried in the blood and produces similar reactions. Here, again, we are unable to see what benefit has been derived from the study of these last two considerations. All of these findings may, however, be considered acquisitions to our storehouse of knowledge, and as abstract facts may at some time, like the stone which was set at nought by the builders, become the head of a corner.

To return to our subject. It would seem that alienists would be more interested in this subject than internists, for to them it has not alone a scientific interest, but an eminently practical bearing. In this field, where conditions are so favorable and the work so promising (we refer to all gastric methods), it is remarkable that so little has been done, for, as von Noorden pointed out many years ago, scarcely any other physician is in so favorable a position to study his patients for months and years, under such excellent conditions for observation, as is the physician in the insane asylum.

Von Noorden, in 1887, was the first to conduct a series of experiments which had in view the determining of the effect of states of mental derangement upon the stomach secretions of the insane. The effect of mental attitudes upon certain gastrointestinal phenomena had long been observed in the medical clinics, and it was because of this that von Noorden sought to extend his observations to the field of insanity. He picked as the object of his research cases of melancholia, for the reason that in this mental state the gastric digestion is generally interfered with in the widest sense of the word. He eliminated all distinct diseases of the stomach, such as cancer, ulcer, and dilatation, and restricted himself to a definite group of cases in the expectation of finding alongside of psychical fancies of a certain type symptoms of a corresponding type.

In his work von Noorden followed Riegel's (1887) scheme for the analysis of the stomach contents. This consisted in the estimation of the total acidity and the qualitative testing for free hydrochloric acid with tropæolin and Congo red paper, for lactic acid with Uffelmann's reagent, and for the peptic power by means of the egg-disk method. The fasting stomach was also examined, and the motor power determined by the amount recovered after an ordinary meal and the condition of the succeeding lavage.

Von Noorden reports in all 14 cases. The results of his investigations are as follows:

The first 12 cases represent states of pure psychical depression, differing from each other only in severity and duration. The first 10 of these correspond in all essential points, namely:

1. The evacuation of the stomach was hastened after the eating of the chief meal, consisting of food of a mixed character.
2. The total acidity reaches its highest percentage value during the process of digestion, as we do not find it in healthy men or only exceptionally so.
3. The strong acidity results entirely or almost entirely from the presence of free HCl, organic acids intrude seldom, and then only in small amounts.
4. The peptic power of the stomach is excellent in the presence of meat. The peptic power of the filtered stomach contents in the presence of the albumin disks is about normal.
5. A continual hypersecretion of the stomach fluids in the sense that at times when the stomach no longer contains food fluid secretion still continues, does not exist.
6. Dilatation of the stomach exists in no case.

Cases XI. and XII. showed what was considered normal secretion, and Cases XIII. and XIV., which had gone into dementia, showed hydrochloric acid secretion lower than normal.

Thus von Noorden overthrew completely the ideas previously held and revolutionized the treatment of stomach symptoms in melancholia, placing it upon a scientific basis. It is to be regretted that others have not extended the work farther and carried on investigations in other mental states.

ORDER OF OUR INVESTIGATION. For purpose of comparison, we have followed, with but few exceptions, the same order of investigation as did von Noorden. Where we made changes we did so because we thought that better and more constant conditions would be obtained.

The selection of patients was made by asylum physicians, with the approval of Dr. William M. Edwards, Medical Superintendent. Only those cases which showed signs of depression were selected, and in all these we had sufficient grounds for making the diagnosis of melancholia. Many were in the beginning stages, while others were in a state of transition into secondary forms of insanity. In our routine work we found that many of the patients examined showed more or less severe stomach disease. These we rejected, retaining only those who showed no signs of organic disease, such as cancer, ulcer, and dilatation. We further endeavored to select patients who made no complaint of stomach symptoms. This was difficult to do, because of the great frequency of such symptoms in melancholia. Because of the great frequency with which we meet with enteroptosis among the insane as well as among patients in our internal medicine clinic, it was next to impossible to obtain sufficient women patients for our investigation without including a few of these (Case I. and Case II., Group II.). However, we do not hesitate to present these, for the reason that the stomach secretions in such cases are as likely to be normal as they are to be abnormal. The majority of such individuals have never had their attention drawn to their stomach until a hospital examination has discovered to them that some of their viscera are displaced.

The Test Meals. We chose as the principal test meal for our investigation the Ewald test breakfast or rather its equivalent: 70 gms. of white bread without crust and 300 c.c. of water. This was removed from the stomach one hour after eating. We selected this meal because it is in more general use among gastroenterologists and because we can better compare results with those obtained in the medical clinic. With but few exceptions we determined the effect of Riegel's test dinner and the ordinary asylum dinner upon the functions of the stomach. In this respect our work differs from that of von Noorden, who employed a mixed meal of soup, meat, potatoes, cabbage, turnips, carrots, spinach, etc., of which his patients were fed an amount that probably fell a little below what they would eat in their normal state. This meal was removed at the height of digestion, a time which corresponded in most of his cases to five or six hours after eating.

The majority of our patients took the food unwillingly after much coaxing, a few, however, seemed to eat with relish and manifested some interest in what we were doing. In no case did we have to resort to gavage.

Examination of the Fasting Stomach. This was done to exclude cases of hypersecretion and to assure us that in those cases where the stomach outlines by the distention test indicated a slight degree of dilatation we were in all probability dealing with a megastria and not with a pathological dilatation, and that in those cases where the stomach outline did not extend beyond what is considered normal, there was no pyloric obstruction of any kind.

Chemical Analysis. We employed for the chemical analysis of all stomach fluids Toepfer's method, controlling the hydrochloric acid test with Gunzberg's reagent and Congo red paper. Lactic acid was tested for by Uffelmann's and Keeling's methods. We are thoroughly familiar with the objections raised to the employment of Toepfer's method, but this is no place to discuss methods; suffice it to say that it has many advantages over the method employed by von Noorden, and that the results obtained may be considered approximately correct. The titrating in each case was almost always made by the same person. This was done to avoid differences that might result from the personal equation. For well-known reasons we considered, however, as the end reaction for the total acidity the appearance of the first permanent pink[1] (not the deep red advised by Toepfer) for free hydrochloric acid, the disappearance of the orange tint.

The peptic value was estimated partly by the egg-disk method and partly by the Mett method. In the latter method the peptic value is expressed by the squares of the millimetres of egg white digested during ten hours' incubation and not by the number of millimetres, as is frequently but incorrectly done. The curdling ferment was tested qualitatively by Leo's method, and starch digestion by Lugol's solution.

Histories. We present a brief history of each case, together with the chemical analysis and other findings. Only those points are given which we think are sufficient to warrant us in deciding that the case is one of depression, as the object of our research is to inquire into the secretions of the stomach in these patients. *The physical examination may be considered negative excepting when otherwise indicated.* With few exceptions, urine, blood, and weight notes are given. These are taken from the asylum records.

CONSIDERATION OF CASES. We report in all 22 cases and have arranged them into three groups. Group I. contains 16 cases, all of which have shown at some time degrees of hyperacidity. Group II. contains 2 cases, both of which show hyperacidity, but, because of certain findings, such as fragments of mucosa, it was thought best to consider them separately. Group III. contains 4 cases showing normal secretions and achlorhydria.

GROUP I.

In this group there are 8 females and 8 males as follows:

CASE I.—Emma G. (see Table I.), aged sixty-one years, married, American, washerwoman, common school education; two children dead. Mother was insane latter years of her life. The patient had pneumonia nine years ago. Since this time her health has been very poor. She has overworked and has had much family trouble. Insanity began in the spring of 1899 with depression, gradually developing into delusions of impending harm. Six months before entering the asylum she had an ovarian cyst removed.

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[1] The standardizing of our decinormal soda solution was done by titrating to the same color.

The patient was admitted to Michigan Asylum for the Insane May 1, 1900. She was profoundly depressed. She would not speak and sighed almost constantly. She soon became agitated, moaned, and at times cried loudly. She was restless and frightened at everything. There has been little improvement during her residence at the asylum. She has suicidal tendencies, threatens to drown herself, but has made no suicidal attempts. She refuses to eat and has to be fed. She will not talk, except occasionally a few fragmentary words. She sits in one place all day with her eyes upon the floor. She escaped once from the asylum in her night-clothes. She has never complained of her stomach. Her appetite is poor and she does not sleep well.

Physical Examination. The patient is of slender frame, 154 cm. high. The musculature is small and wasted. The skin is sallow and anæmic. The tongue is pale, moist, swollen, and has a white coating all over. Her memory is impaired temporarily, indication is weak and mentalization is slow.

Heart: Soft blowing systolic murmur at apex, otherwise the heart is negative. Pulse, negative.

The abdomen is below the level of the ribs. There is slight bulging just below the umbilicus and a laparotomy scar. The abdomen is easy to palpate. There is no succussion in the stomach. On distending the stomach with air, the greater curvature is seen two and a half inches below the umbilicus, the lesser curvature at the umbilicus.

Pelvis: Slight laceration of cervix. Uterus is retroverted.

Blood: Red cells, 4,800,000; hæmoglobin, 72 per cent.; white cells, 3820.

Urine: Negative on all occasions.

The stomach secretions in this case were observed, as will be seen from the accompanying table, from May, 1900, to December, 1902. For eight months at the times when Ewald test meals were given, there was always, with but one exception, a distinct hyperchlorhydria.

Case II.—Clara H. (see Table II.), aged sixty-eight years, married, American, housewife; three children; common school education. Her father was insane. The patient was always quiet and reserved in her manner until three months previous to her entrance to the asylum. At this time she began to be more talkative and apprehensive. She had delusions that her family were going to lose their property and that she was going to be killed; that she was possessed of a devil and that brimstone was coming out of her. She attempted suicide by cutting her throat.

The patient was admitted to the Michigan Asylum for the Insane in January, 1902. She was profoundly depressed and was suspicious of everything. As a rule, she would not talk. She worried much, and occasionally said that she was wicked. At times she became very restless and much agitated. Her appetite was irregular, sometimes very good; at other times she refused to eat. Her bowels were constipated. She did not complain of her stomach. May 24, 1902, she was less depressed than when she entered.

Physical Examination. The patient is fairly well nourished.

Abdomen: The abdomen is flat and below the level of the ribs. The panniculus is thin. The kidneys and spleen cannot be felt. Palpation is negative. It is almost impossible to find out more about her abdomen. She absolutely refuses and resists food and stomach tube. There is no evidence that her stomach is dilated or prolapsed.

Blood: Red cells, 4,000,000; hæmoglobin, 75 per cent.; white cells, 9772.

Urine: There is a trace of albumin, a few hyaline casts.

Weights: July 22, 1902, 83¾ pounds; May 31st, 94½ pounds; August 31st, 97½ pounds.

CASE III.—Lizzie W. (see Table III.), aged thirty-nine years, married, American, housewife. Family history negative. Syphilis suspected. Three months before admission to asylum she began to have delusions and was quite hypochondriacal. She was very irritable and at times became agitated. She thought her husband was going to murder her and she grew violent.

Patient was admitted to asylum February 9, 1901, in an extremely confused condition. She had delusions of persecution. Three days later she had one or two epileptiform attacks, later she grew noisy, and in the following July had a paretic stroke. She recovered from this and continued in her delusion that someone was trying to kill her. She refused to eat at times because, as she said, she knew the food contained poison. December 19th she was removed somewhat improved. January 2, 1902, she was returned in the same condition as before. She now had delusions that her clothes were filled with snakes. She was much depressed, crying much of the time. She died June 2, 1902, after a convulsion. No stomach complaints.

Abdomen, negative; stomach in normal position.

Gynecological Examination. Labia minora hypertrophied, laceration of cervix. Urine, negative.

Stomach observations were made at intervals from February, 1901, to July, 1902. During eleven months at the times when examinations were made a distinct hyperchlorhydria was found after the Ewald meal.

CASE IV.—Mary L. B. (see Table IV.), aged forty-eight years, single, American, housewife. One uncle insane. One aunt committed suicide. The patient has always been peculiar, easily excited, and easily irritated. In August, 1900, she began to show signs of insanity. She was much depressed. In February, 1901, she took carbolic acid into her mouth, incurring some burns on her lips and tongue. She believed herself to be a great sinner and that she would never be saved. Her appetite was poor and she did not sleep well. She said her stomach never troubled her.

The patient was admitted to the Michigan Asylum for the Insane February 16, 1901. She was decidedly agitated and showed hysterical and suicidal tendencies. Her wickedness gave her much concern, and she would not be moved from the idea that she had ruined and disgraced her family. She showed suicidal tendencies. During her residence at the asylum her appetite improved and she slept better. Her mental condition, on the other hand, did not improve. She grew more restless and agitated, would not stay in bed and picked at her hands and face. She committed suicide by hanging.

Physical Examination. The patient is poorly nourished and looks somewhat emaciated.

Examination of Blood: Red cells, 4,000,000; hæmoglobin, 98 per cent.; white cells, 6663.

Urine: Negative.

Stools: Somewhat constipated.

Weight on admission, 103¼ pounds.

There has been practically no change in weight during her residence.

Case V.—Hannah B. (see Table V.), aged fifty-seven years, married, American, housewife. One daughter insane. First signs of mental derangement began in October, 1899, supposedly due to worry over the death of her sister. She became melancholy, thought someone was watching her and was trying to take her away. She showed suicidal tendencies; indeed, she attempted to take her life by jumping into a well.

The patient was admitted to the Michigan Asylum for the Insane January 28, 1900. She is much depressed. She complains of her stomach being sour and a feeling of heaviness in the epigastrium. Her appetite is poor. During her residence at the asylum she steadily gained in physical and mental strength and was discharged January 1, 1901, cheerful and apparently free from depression. She was readmitted April 7, 1902, and at the same time her daughter was admitted. She remained quite well until recently, when she became irritable, obstinate, and emotional. She has worried over her daughter and is quite depressed. She attempted suicide by refusing to be removed from the railroad track. She continues to complain of her stomach. Her food comes up into her mouth; it is sour and produces a burning sensation in the tongue. She says that she has raised blood, bright red in color; it has a disagreeable taste and occurs in the morning and sometimes during the night. She does not know where it comes from. She vomits occasionally. She coughs considerably, but has not raised any sputum. She is constipated, and her appetite is poor.

Physical Examination. Patient is slightly emaciated, average-sized skeleton, skin is sallow; panniculus is thin; mucous membranes are pale. Tongue swollen, flabby, pale, coated white. Teeth are good.

Lungs: Thorax is long, broad, but shallow. Expansion is fair and symmetrical. Percussion is negative. On auscultation there are distinct crackling rales on the right side over the first and second ribs near the sternum; otherwise examination of the lungs is negative.

Heart: Apex inside nipple, fifth interspace costal. Heart dulness not increased. Heart sounds are weak. There is a very soft, faint, blowing, systolic murmur at the apex.

Abdomen: The abdomen is on a level with the ribs; the walls are very flabby; the panniculus is thin. There is tenderness on pressure over the epigastrium. Liver, spleen, and kidneys negative. Stomach negative.

Blood: Red cells, 4,000,000; hæmoglobin, 80 per cent.; white cells, 3552. Later red cells, 4,800,000; hæmoglobin, 77 per cent.; white cells, 8240.

Urine: No albumin, very few hyaline casts.

Weights: April 7, 1902, 131 pounds; June 30th, 131 pounds; July 31st, 134¼ pounds.

While there are some symptoms of ulcer in this case, our observation has led us to believe it does not exist, and that these symptoms are not sufficient to rule the case out.

CASE VI.—Olivia B. (see Table VI.), aged thirty-five years, single, American, dressmaker, common-school education. Mother is insane. The patient has always been well, of a kind and quiet disposition, fond of company and industrious. She has worked very hard and has eaten little. In March, 1902, she became insane; she had delusions that men on the street were pointing their fingers at her and making fun of her, that her customers did not care for her work any more, that she had done something wrong and that the people would not forgive her. She refused to eat because she thought the food contained poison.

The patient was admitted to the Michigan Asylum for the Insane April 7, 1902. She was depressed; she talked freely, however, and wondered why she was brought to the asylum. She is much confused and cannot reason; she keeps asking the same question over and over. She worries much over something she has done that cannot be forgiven. She is suspicious, cries much, and fears that something dreadful will be done to her. She has shown no suicidal tendencies as yet. Her sleep is disturbed. Her appetite is variable. She never complains of her stomach. Her bowels are constipated.

Physical Examination. The patient is well nourished and strong. Mucous membranes are slightly pale.

Heart: Apex fifth intercostal space, inside the nipple line. The heart dulness is not increased. There is a loud blowing systolic murmur at the apex transmitted into the axilla.

Blood: Red cells, 4,000,000; hæmoglobin, 75 per cent.; white cells, 5584.

Urine: Negative.

Weights: April 7, 1902, 109 pounds; May 31st, 109 pounds; August 31st, 111¼ pounds.

CASE VII.—Helen C. (see Table VII.), aged twenty-four years, single, American, schoolteacher. Paternal grandfather was insane, maternal grandmother died from some cord disease; father and mother both very nervous.

Patient is a college graduate, and was considered a bright student. She taught school one and a half years. Her career as a teacher was unsuccessful, and her work soon became distasteful to her. She became very nervous, and soon lost all control of herself. She would walk up and down her room, wring her hands, and talk in a confused manner.

Insomnia developed, and she became more depressed with the delusion that she had failed to seize opportunities for bettering herself and family, and for this reason they were coming to want.

Patient was admitted to the asylum February 25, 1902, in an extremely restless condition. She would run from one room to another, moaning and crying. She slept but little. Her appetite was variable. The following December she showed inclination to become violent by striking her fellow-patients. She left the asylum January 29, 1903. Since that time she was operated on for removal of the clitoris. She improved for a time, but is now quite nervous.

Physical examination at the time of her admission was negative, with the exception of a systolic murmur at the aortic and pulmonary areas and a somewhat anæmic appearance.

The abdomen is negative, stomach in normal position.

Gynecological Examination. Slight hypertrophy of labia minora and clitoris.

Blood: Red cells, 4,000,000; hæmoglobin, 58 per cent.; white cells, 1400.

Urine: Negative.

June, 1904, patient perfectly well and has been for some months.

CASE VIII.—Anna R. (see Table VIII.), aged fifty years, married, German, housewife. Admitted to asylum June 26, 1900. No insanity in family. About the time of the menopause (1898) she became depressed and agitated, worried much because she thought she had killed her son. Later on she became very incoherent and extremely restless; she walked the floor almost incessantly night and day, crying and moaning. She is very untidy in her general appearance and habits. She has hallucinations of hearing, delusions of depression, ideas of persecution. Sensations are painful. Psychomotor processes decreased.

Her bowels are constipated; she complains of her food coming up in her mouth; she vomits occasionally. Her appetite at first voracious; later on became poor. She gained in weight at first, then lost. During her stay in the asylum, over one year, her depressive delusions did not abate; she constantly worried over imaginary troubles. She died December, 1901, after laparotomy (anterior fixation and perineorrhaphy).

Patient is fairly well nourished, and abdomen negative.

Blood: Red cells, 4,000,000; white cells, 4774; hæmoglobin, 85 per cent.

Urine: No albumin, but a slight excess of leukocytes; otherwise negative.

Weights: June 26, 1900, 95 pounds; June 30, 1901, 118½ pounds; November 30th, 128 pounds.

Postmortem was permitted, but only to ascertain condition of the pelvis. Stomach was not examined.

CASE IX.—Hugo A. (see Table IX.), aged thirty years, single, German, factory hand. Family and personal history unknown.

The patient's conduct until within ten days of his admission to the asylum was not observed to be particularly out of the ordinary. He was admitted October 10, 1902, when he became suddenly violent and maniacal. This mental state was very soon followed by depression and agitation. He became anxious about himself and worried much. He has delusions regarding his digestive organs, thinks they are displaced. He begs for an operation to replace them. His general appearance is that of depression. He becomes agitated at times. Has made no suicidal attempts. His appetite is good and his bowels normal. This state of depression continued over one month prior to our investigation of his case and still remains so.

Blood: Red cells, 5,240,000; white cells, 3424; hæmoglobin, 72 per cent.

Urine: Negative.

Weights: October 10, 1902, 144 pounds; 17th, 153 pounds; 24th, 149 pounds; December 4th, 144 pounds.

CASE X.—Frank W. C. (see Table X.), aged thirty-four years, married, American. Maternal uncle was insane. Patient had always been a man of good habits until his mental derangement began a few weeks before his admission. During this time he had been acting peculiarly, and on November 24, 1902, he developed the idea that people were following him for the purpose of killing him. He entered a hardware store for the purpose of purchasing a revolver, but was taken into custody.

Patient was admitted to the asylum November 27, 1902, with marked hallucinations of hearing. He was very suspicious of those about him, fearful of injury, and thought he would be mutilated in some way before he would be allowed to leave the asylum.

He became very restless and confused mentally. He showed some signs of improvement and was discharged January 14, 1903. It was necessary to readmit him a few days later because of increasing delusions and hallucinations. He was much depressed, cried much, thought his wife was unfaithful. A few days later he again showed signs of considerable improvement and was discharged.

Physical examination shows apex beat slightly displaced to the left. There was slight roughening of the first sound at the apex.

Urine: Small amount of albumin, excessive leukocytes.

Blood: Red cells, 5,240,000; white cells, 6472.

CASE XI.—Hugh L. (see Table XI.), aged thirty-eight years, married, American. Family history negative. In May, 1902, patient developed peculiar ideas. Thought people were trying to injure his reputation and do him harm. He became restless and sleepless, and his appetite became capricious. The following November he attempted suicide twice. Tried to drown himself.

Patient was admitted to the asylum November 10, 1902. He thought he had done a great wrong to many people. That he had lost all his property and that his friends had deserted him. He was much depressed and felt that he was unfit to live. He refused food because he thought it was needed for someone else. In a few weeks he showed signs of improvement. His delusions grew less, and in the following May, 1903, he was discharged as recovered.

Patient was readmitted in October, 1903, having again become incoherent in his conversation and mentally confused. He was depressed and emotional. He showed improvement again, and was discharged February 6, 1904, practically improved.

Urine: Negative.

Blood: No report.

CASE XII.—George K. (see Table XII.), aged twenty-three years, single, American, teacher. No insanity in family. Personal history negative. In March, 1902, patient began to show signs of mental derangement. He became irritable and sleepless. He worried much about his bad habits, and thought his illness due to his meanness. He endeavored to avoid seeing people, preferring to be quiet. Thought people were watching him and would hide himself under the barn for hours. He was admitted to the asylum October 2, 1902, depressed and delusional. Believes he has been very wicked and that he is unworthy, begs to go home, so that he can ask forgiveness of everyone.

Abdomen just below the level of ribs, symmetrical. Palpation, etc., negative. On distending stomach with air, the greater curvature is found two fingers above the umbilicus.

Blood: Red cells, 6,000,000; hæmoglobin, 75 per cent.; white cells, 4569.

Urine: Negative.

Weights: October 1, 1902, 160 pounds; November 1st, 173 pounds; December 1st, 176 pounds.

Case XIII.—Frank K. (see Table XIII.) aged thirty-eight years, married, Austrian, varnisher. Family and personal history unknown. June, 1902, he became depressed, moody, restless, and irritable. He was admitted to the asylum July 14, 1902, decidedly depressed, quiet, and unconcerned by what transpired about him. His sleep is poor; he has hallucinations of hearing and passes much of his time crying and sorrowing. His appetite is poor but he has no complaints concerning his digestion. His bowels are constipated.

Abdomen is on a level with the ribs. The stomach is in normal position.

Blood: Red cells, 4,300,000; hæmoglobin, 85 per cent.; white cells, 2284.

Urine: Negative.

Weights: July 15, 1902, 143 pounds; 30th, 145 pounds; August 13th, 149 pounds; December 4th, 151 pounds.

Case XIV.—Herman O. (see Table XIV.), aged twenty-four years, single, American, medical student. There is no history of insanity in the family. The patient has always been well and of more than ordinary mental ability. He showed no signs of mental derangement until December 3, 1900; at this date he purchased some arsenic and opium with the intention of committing suicide. For two years previous to this he worried much and complained of his stomach. It is thought that he applied himself too closely to his studies.

Patient was admitted to the asylum December 7, 1900. He was much depressed, introspective, and moody, and decidedly hypochondriacal. He has marked delusions concerning his stomach; he complains of distress in the stomach, but his complaints are vague and unsatisfactory. The bowels are normal.

Blood: Red cells, 3,000,000; hæmoglobin, 90 per cent.; white cells, 5204.

Urine: Negative.

Weight: December 2, 1902, 154 pounds. We were unable to find other weights.

Case XV.—George E. B. (see Table XV.), aged fifty-five years, married, American, farmer. Nothing known of family history. Patient had always been healthy until his insanity began in the spring of 1902. At this time he became greatly depressed, worried over small matters. He complained of his stomach, and it is thought by members of his family that when his stomach symptoms became aggravated his depression increased. About one month after the onset of his mental derangement he attempted to poison himself. His condition improved, however, in the course of a few months, but he soon returned to his state of depression, attempting to kill himself several times by hanging. His only delusion has been that he considers it his duty to kill himself because of his unworthiness. At times he is agitated.

Urine: Negative.

Blood: Red cells, 4,860,000; white cells, 9265; hæmoglobin, 90 to 100 per cent.

Weights: December 10, 1902, 155 pounds; 17th, 157 pounds; 24th, 155 pounds; 31st, 155 pounds.

CASE XVI.—John V. (see Table XVI.), aged forty-five years, married, Hollander, common-school education. His mother was insane for a short time; otherwise family history is negative. Patient has always been a man of good habits. He was insane four weeks prior to his admission to the asylum, December 8, 1900. He began to act peculiarly, and for a time refused to speak; soon after this he became suddenly elated, yelling and whistling and making unusual disturbance. He did not sleep and talked incoherently. When admitted he was in a state of acute mania, which continued for four months, during which time he gained in weight and general bodily nutrition. In March, 1901, he began to be depressed. He sat around the ward worrying about himself and his family, and continued in this condition for eight months, when he was discharged as improved. When first deranged he had a voracious appetite, but later he became irregular about his eating.

Urine: Negative.

Blood examination was not made.

Weights: December 17, 1902, 146 pounds; January 10, 1903, 135 pounds; October, 146 pounds.

DISCUSSION. The results of the preceding examinations may be summed up as follows:

1. The evacuation of the stomach after the test breakfast is hastened in 1 case, normal in 6 cases, and somewhat delayed in 9 cases. After the Riegel or ordinary asylum meal the evacuation is hastened in 8 cases, normal in 1 case, and delayed in 3 cases. The remaining 4 cases received no large test meal. We may say in general that after a small stimulus, such as that received by the Ewald test breakfast, the evacuation of the stomach is usually normal or somewhat hastened; while after the large stimulus of the Riegel and ordinary asylum meal it is more frequently hastened.

2. The free hydrochloric acid value ranges from 60 to 90 per cent. in 12 cases, from 50 to 58 per cent. in 4 cases. These may all be justly called cases of hyperchlorhydria.

3. The total acidity ranges from 90 to 111 per cent. in 10 cases, from 73 to 88 per cent. in 6 cases. It is always above what is usually accepted as normal. They may all be classed as cases of hyperacidity, according to the method of Riegel as employed in 1887, and they accordingly correspond to those reported by von Noorden.

4. The peptic value is up to normal in all cases, often somewhat

increased. The latter condition is especially noticeable in those cases where Mett's method was employed.

5. Hypersecretion is present in no cases.

6. Lactic acid and signs of fermentation are never encountered.

7. The hyperacidity may be said to be constant in most cases, as it persisted for a few months, and in a few cases for many months. The question of the constancy of the secretions was raised by von Noorden, as his cases were observed only over a short period.

8. Retention and dilatation exist in no case. Case I. shows a distinct gastroptosis.

9. Fragments of mucosa were found only in 1 case; unfortunately this was lost and its character is not known. It was a small superficial piece.

10. Stomach symptoms were complained of in 4 cases, Cases V., VIII., XIV., and XV. In Case V. the symptoms were those of hyperacidity.

11. Mucus was not excessive in 13 cases. Slight excess was noted in 3.

12. Males and females equally affected. Von Noorden's observations were upon women only.

Explanations. (Ad. I.) It is impossible to fix a definite line for the normal amount of residue after any meal. This has to be left to the judgment of the practised eye. If we find only a few c.c. on an empty stomach three or four hours after an ordinary dinner or a Riegel meal, we say that the evacuation is increased. If we find 50 or 60 c.c., or possibly a little more, we say that the evacuation is about normal. If, on the other hand, we find that 100 c.c. or over are present, we say that the evacuation is delayed. The amount is estimated by what is recovered before and after the lavage. A somewhat extended experience in the University Hospital and in private practice had led to the belief that the majority of so-called normal stomachs contain some food as long as five hours after the ordinary mid-day meal, which is the heavy meal of the day in this locality.

(Ad. II.) The question of normal acidity values is also a perplexing one. The stomach is capable of very wide daily variations. But if we take, for instance, the average figures of Riegel for normal free HCl secretion, 20 to 40 per cent., and consider 50 to 70 per cent. moderate increased secretion, and 71 to 100 per cent. high secretion, then the large majority of our cases are confined to the middle group. Von Noorden did not touch upon this point, as he made no direct estimations of free HCl.

(Ad. III.) We may here compare our results with those of von Noorden, and to do this we must use his figures. He arranged three groups of acidity values; from 0.24 to 0.29 per cent., or, according to the Ewald notation, from 66 to 80 per cent. slight secretion. From 0.30 to 0.39 per cent., or, according to the Ewald notation, 80 to 100 per cent., medium secretion. From 0.40 to 0.50 per cent., or, according to the Ewald notation, 100 to 115 per cent. and higher, highest degrees of secretion. The majority of our cases occupy the middle group; they rarely intrude upon the third group, but in a few instances are found to occupy a position in the upper part of the first group. It will be seen that the variations in some cases are quite great. In all of these respects our observations are remarkably parallel with those of von Noorden, with the exception that our stimulus was less. The total acidity is in all cases above the generally accepted 70 per cent. as the beginning of hyperacidity after an Ewald meal.

(Ad. IV. to X.) These points require no further explanation than will be found under "Order of Investigation."

(Ad. XI.) The amount of mucus was estimated by inspection with the aid of a glass rod or the fingers. The saliva was prevented as far as possible from getting into the stomach contents. Excess of mucus was noted when ropy strings were present.

GROUP II.

CASE I.—Frank S. (see Table XVII.), aged fifty years, single, American, cabinetmaker. One sister mentally deranged. No other history of insanity in family. Patient has always had good health. He was of a cheerful temperament, led a moral life, and was above the average in mental ability. He was of an inventive turn of mind, and his mental derangement is attributed to disappointment over the failure of some of his inventions. Insanity first manifested itself by the gradual oncoming of depression and melancholy. He became sleepless. His appetite became poor, and his general health began to fail. He complained of constipation and loss of weight.

Admitted to the asylum January 3, 1901, six months after the first signs of mental change. He was very quiet, downcast, and spoke only in a whisper. He had delusions which were mostly somatic. He made no definite complaints concerning his stomach, except that at times there was a feeling of distention. He attributed his condition, however, to something wrong with his bowels and insisted that this could never be improved. He had a delusion that his stomach was made of some hard material, that his food was not digested, and that nothing ever passed his bowels. He manifested suicidal tendencies, professing that if he "had the nerve" he would kill himself. Attempted suicide once by hanging. His bowels are constipated. He constantly worries.

Patient is somewhat undernourished.

The abdominal walls are flabby. The panniculus is thick. When distended with air the greater curvature of the stomach is seen to be just at the umbilicus. Otherwise the abdomen is negative.

Blood: Red cells, 4,800,000; hæmoglobin, 75 per cent.; white cells, 4061.

Urine: Negative.

Weights: July 1, 1902, 164 pounds; May 28th, 168 pounds; July 23d, 165 pounds; September 11th, 157 pounds.

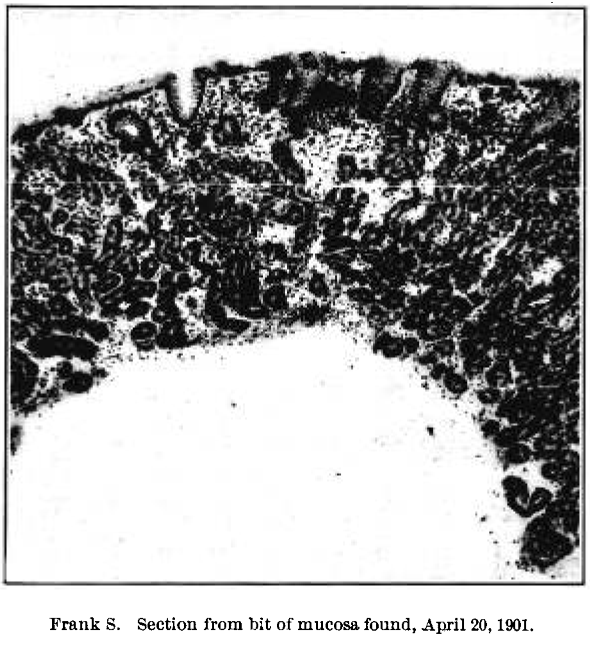
This patient was under observation for fifteen months. Hyperchlorhydria was present practically during all this period.

Dr. Warthin's report on the fragment of mucosa found in the eye of the stomach tube April 20, 1901.

Portion of gastric mucosa cut obliquely; entire mucosa atrophic; excessive mucous formation; majority of gland cells show some mucin; few acid cells; no lymphoid tissue; slight increase of interstitial tissue; slight small-celled infiltration of the upper portion of the mucosa.

Pathological Diagnosis. Early stage of atrophic catarrhal gastritis. (See Fig. 1.)

FIG. 1

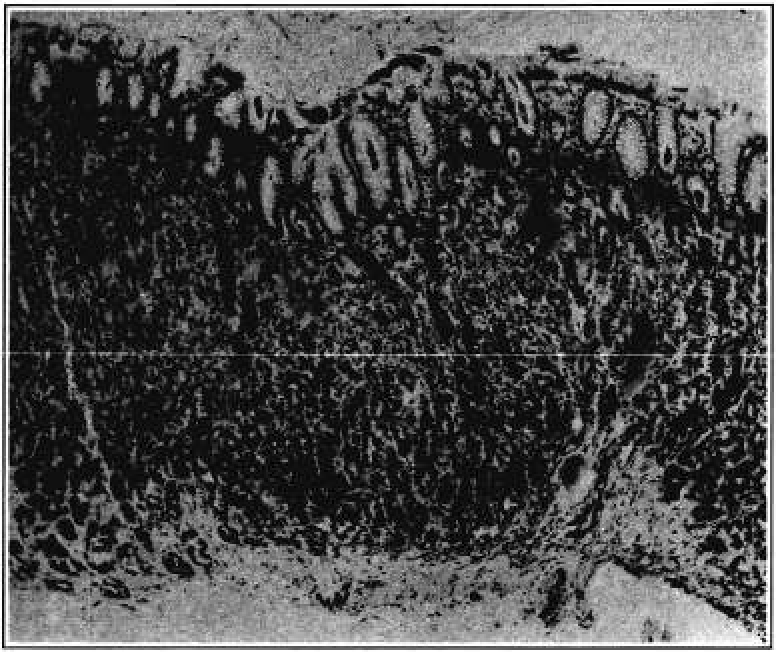


Frank S. Section from bit of mucosa found, April 20, 1901.

CASE II.—Martha Y. (see Table XVIII.), aged fifty-six years, married, American, housewife. Patient has three children and has been above the average in mental ability. One brother committed suicide; otherwise family history is negative. Insanity began three weeks before admission to the asylum in September, 1899. It was thought to be due to the menopause. She began to write letters to various people stating that she had sinned against the Holy Ghost and that her wickedness could never be forgiven. She imagined that she had ruined her family and that she robbed her husband of $75,000. She had hallucinations of impending harm to herself and children; also hallucinations of taste and hearing. It was not long before she became somewhat agitated. She is extremely depressed.

After eight months' stay in the asylum she had improved slightly, was discharged, but was returned in a few weeks in the same condition as before. She has threatened suicide frequently. She has had a delusion that her bowels have not moved for six months. June 1901, attempted hanging. She constantly brooded over her wickedness.

FIG. 2



Martha Y. Section from bit of mucosa found, February 26, 1901.

Patient's appetite has always been good; she constantly laments because she feels inclined to eat too much, but at no time has she complained of symptoms referable to her stomach. Says that she has no stomach.

Patient is well developed. Panniculus is quite thick. The abdomen is level with the ribs, walls are firm, making palpation difficult. No tenderness at any point. Examination is negative.

Stomach: The lesser curvature is one and a half fingers above the umbilicus, greater curvature two and a half to three fingers below.

Gynecological examination shows cystocele, rectocele, slight perineal laceration.

Blood: Red cells, 3,550,000; white cells, 4800; hæmoglobin, 75 per cent.

Urine: Negative.

Note August 5, 1902. Patient has deteriorated in physical health. When she entered the asylum she weighed 152 pounds, now 99 pounds. Since her admission she has had an attack of diarrhœa, and during the epidemic of smallpox in the institution in 1901 she was one of the most severely attacked. These two conditions are responsible for her loss in weight. There is no evidence of malignant disease.

Patient died after laparotomy. No autopsy could be obtained. The abdomen was, however, opened and the stomach was found to be of normal size and free from any new-growth or ulceration. The patient had been under observation for eighteen months, during fifteen of which hyperchlorhydria was always present after an Ewald meal.

Dr. Warthin's report. Fragment found February 27, 1900.

Bit of mucosa extending in places to the basement membrane, portions of which are present; mucosa is atrophic, less than two-thirds normal thickness; no lymph follicles present; very few acid cells; capillaries conjested; no increase of interstitial tissue; no excessive mucus formation.

Diagnosis: Simple atrophy. (See Fig. 2.)

Discussion. A careful consideration of both of the cases in this group shows that, aside from the finding of fragments of mucous membrane in the stomach contents, they correspond exactly with those of the first group. These bits of mucosa were placed almost immediately into 95 per cent. alcohol, and because of the appearance of fresh blood, their shape, and relation to the tube, there can be no question but that they were torn from the mucosa during the process of emptying the stomach and the withdrawal of the tube. They may therefore be looked upon as representing the true conditions going on in the area of the mucosa from which they came, uninfluenced by any action of the gastric juice after detachment from their blood supply.

In both cases there is evidence of atrophic change. In Case I. the atrophy is more noticeably associated with a progressive gastritis or degeneration; while in Case II. there is no excessive mucous formation, but the change is distinctly one of simple degeneration or atrophy of the glandular elements, resulting in a thinning of the entire mucosa. It is true that we are here dealing with a very limited portion of the mucosa only, and that we can make no positive statement of what is taking place in the mucosa beyond this limited area.

However, there is every reason to believe that the changes are at least going on in a more or less circumscribed area larger than the fragments found in the washings, for in the latter case pieces of mucosa were found on three different occasions, the last piece being found three months after the second, and in all similar changes are seen. Further, the pathological change is more or less evenly distributed throughout the sections. It may, therefore, be assumed that there are other areas of the same nature scattered throughout the mucosa. This being the case, there would be reason to believe that with such a change, resulting in compression and degeneration of the glandular elements, the secretions, under ordinary circumstances, would be lessened. The question that naturally follows is, What is the cause of the apparent oversecretion or hyperacidity?

In answer to this question, three theories may be advanced:

1. That at some time the patients have had a much higher hydrochloric acid secretion and that the present more or less constant secretion is due to progressive anatomical changes.
2. That the remaining intact glands are doing compensatory service.
3. That the increased secretion is due to the influence of the neurosis or psychosis.

Knowing that the stomach glands are capable under normal circumstances of performing unlimited service according to the demands made upon them, as is shown, for instance, in the greater secretion after an albuminous meal than after a meal made up principally of carbohydrates, and in view of the fact demonstrated by von Noorden and ourselves that hyperacidity is present in a large percentage of cases of mental depression, we are inclined to the third opinion and think it is not unreasonable to expect that, in spite of the progressive anatomical change, the neurosis or psychosis is responsible for the increased secretion.[1]

GROUP III.

This group contains the remaining cases of our series. Cases that were selected in the same way as those that have gone before. They do not meet the requirements set by von Noorden in order to be considered cases of hyperacidity. Cases I. and II. have, however, fairly high hydrochloric acid values at times. Cases III. and IV. are practically cases of the so-called achylia.

CASE I.—Arthur P. (see Table XIX.), aged forty-three years, married, American. Little known of family history, except that he was always weak-minded, a bar-room lounger, and a rough fellow in general. Six months prior to his admission to the asylum he threatened to assault his father with an axe. He wandered from place to place.

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[1] Hemmeter reports twelve cases of anacidity and subacidity in which fragments of mucosa were found. Proliferation of the glands was present in one case with well-marked round-celled infiltration.

Patient was admitted to the asylum March 1, 1893. He was easy to manage, observed the rules of the institution well and had no idea of his mental condition. The following June he developed fault-finding and whining, frequently showing a mean disposition, annoying other patients. March 19, 1894, showed much excitement; thought he was going to die; that his heart was moved from its normal place and that it was bleeding. He became confused and thought that there was something inside of him that migrated with regularity from his breast bone to his rectum. September 22, 1896, these hallucinations were still present, and he was if anything more depresed than before. In March, 1901, complained of various animals in his abdomen; thought someone was trying to poison him. He now thinks that the lining of his stomach is loose and turned upside down. He eats well and is much improved in physical strength.

Physical examination is entirely negative.

Case II.—Wilhelmina D. (see Table XX.), aged sixty years, married, housewife, native of Holland. One brother insane. Patient has always been of a nervous temperament; her mental ability was good. At the age of fifty she became insane, but recovered from this attack in about thirteen weeks. In April, 1897, she became insane again; she imagined that she was lost forever; that she had cancer of the stomach. She insisted that she felt something crawling in her stomach. She was frequently nauseated and at times vomited. Her sleep was disturbed and her appetite was poor.

The patient was admitted to the Michigan Asylum for the Insane September 28, 1897. She was depressed and worried because she thought she had a cancer. She abandoned this idea quite a little, however, when she was assured that such was not the case. Her delusions were those of hypochondria; she had a pain in a new place every day. She was removed from the asylum November 10, 1897; readmitted December 28, 1902, after having been in several institutions and taking a sea voyage. She was no better and had very painful delusions. She thinks her husband is going to shoot her, that people are running electric wires into her house, and that someone is going to chloroform her. She complains of her bowels rumbling constantly, so that she cannot rest; she is sure this condition is worse when the stomach is empty. She is much given to whining. It is thought that she is a morphine-eater. She has improved quite a little since her readmittance. Her appetite is good. She sleeps better, but her bowels are somewhat constipated.

Abdomen: There is tenderness in the region of the liver.

TABLE I.—Emma G.

Explanation of characters: + ++ = Lugol. M.B., V., R.V., R., and A.C. = Experimental meal.

	Motility tests.					Acids.					Ferments, etc.					
Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennen coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1900		hours	c.c.							hours	min.				
1	May 20	Ewald	1	24	Clear	0	++	36	42	111	3½	...	...	...	...	
2	" 20	Riegel	4	0	Much meat	...	...	...	...	...	...	...	...	...	...	By mistake meat was not chopped; tube clogged.
3	Dec. 6	Ewald	1	110	Practically clean	...	++	57	32	98	4	8	M.B.	0	0	
	1902															
4	Jan. 3	"	1	45	Very little bread	0	++	72	4	94	4	5	V.	0	0	Alizarin titration made with 1 c.c.
5	" 4	"	1	40	....	0	++	64	8	78	...	5	V.	0	0	Patient hard to manage; no lavage given.
6	" 5	"	1	35	Much bread	...	++	65	12	82	4	...	R.V.	0	0	Titrations made with 1 c.c. except for total acid.
7	" 14	Asylum supper	14	0	See remarks	...	...	...	...	...	...	...	...	0	0	Only a few blood-stained strings of mucus could be obtained by washing.
8	" 18	Riegel	3½	0	Many small meat bits	...	0	...	...	...	...	...	...	...	...	A number of small meat bits found in wash-water.
9	Dec. 2	Asylum breakfast	4	...	....	...	...	35	10	50	...	...	...	...	...	

TABLE II.—Clara H.

Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennen coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c.c.							hours	min.				
1	Feb. 20	Ewald	1	80	Practically clean	0	+	78	20	108	4½	...	M.B.	0	0	
2	" 26	"	1	45	Practically clean	0	+	78	20	108	5	...	...	0	0	
3	" 28	Asylum supper	15	0	Nothing	...	...	...	...	...	...	...	...	...	...	Fasting stomach; patient absolutely refuses to eat any more test meals.

TABLE III.—Lizzie W.

	1901		hours	c.c.							hours	min.				
1	Feb. 22	Ewald	1	80	....	0	+	64	18	92	3	10	R.	0	0	Lavage could not be given; patient much agitated.
2	1902 Jan. 27	"	1	150	....	0	+	50	18	84	...	10	R V.	0	0	Very little mucus in washings.
3	" 31	"	1	80	....	0	+	62	28	96	...	...	R.	0	...	Stomach fluid stood 24 hrs. before examined; no evaporation.
4	Feb. 1	"	1	125	....	0	+	48	20	76	...	...	R.	0	0	
5	Nov. 30	"	1	65	....	0	+	12	4	44	36 mm.*	x	R.V.	...	...	
6	Dec. 2	Riegel	3	50	Some food	0	+	25	30	65	...	...	...	...	...	
7	" 3	Asylum supper	14	3	Little mucus	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE IV.—Mary B.

	1901		hours	c.c.							hours	min.				
1	Feb. 22	Ewald	1	80	....	0	+	60	26	92	4	5	R.V.	0	0	Mucus not excessive.
2	Mar. 4	"	1	60	....	0	+	42	12	72	2¾	5	R V.	0	0	Considerable mucus.
3	" 5	"	1	55	....	...	+	54	18	76	4½	5	R.V.	0	0	
4	" 6	"	1	80	....	0	+	46	32	88	...	...	R.	0	0	

TABLE V.—Hannah B.

	1902		hours	c.c.							hours	min.				
1	April 11	Ewald	1	60	....	0	++	62	10	78	...	...	R.V.	0	...	Patient difficult to manage.
2	" 12	"	1	80	....	0	++	52	6	66	...	...	R.V.	0	x	Few yeast cells and bacteria.
3	" 13	"	1	60	....	0	++	48	10	64	...	...	R.V	0	x	Many yeasts.
4	May 20	Riegel	4	few	....	...	...	...	...	acid	...	...	...	0	...	Patient cannot be managed.

TABLE VI.—Olivia B.

		Motility tests.				Acids.					Ferments, etc.					
Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c.c.							hours	min.				
1	May 14	Ewald	1	250	....	0	++	46	20	74	4	...	M.B	0	0	Lavage omitted; patient violent.
2	" 16	"	1	200	....	0	++	52	14	72	4	...	M.B.	0	0	" " " "
3	" 23	Riegel	3½	150	....	...	++	48	30	96	3½	0	A.C.	0	0	Milk not curdled after two hours in oven; chymosinogen test was not made.
4	July 19	Ewald	1	200	....	0	++	42	12	74	4	...	A.C.	0	0	Digestion of egg tablet complete.
5	" 19	Asylum supper	14	0												

TABLE VII.—Helen G.

Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c.c.							mm.*	min.				
1	Dec. 30	Ewald	1	170	Clear	...	++	48	12	67	11	+	M.B	0	0	
2	" 31	"	75 m.	58	"	...	++	50	16	73	15.5	+	R V.	0	0	
	1903															
3	Jan. 1	"	90 m.	60	"	...	++	50	13	70	15	+	R V.	0	0	Fasting stomach completely empty.
4	" 3	"	50 m.	...	....	...	++	30	14	68	7.8	+	...	+	0	Last observation of experimental meal.

* Peptic value, Mett's method.

TABLE VIII.—Anna R.

Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1900		hours	c.c.							hours	min.				
1	Dec 1	Ewald	1	65	Clear.	0	++	52	26	84	6	7	R.V.	0	0	
2	" 1	Asylum dinner	3½	...	"	0	0	...	...	...	...	...	...	...	...	Only a few shreds of meat recovered.
3	....	Asylum supper	15	...	"	0	0	...	...	acid	...	...	...	...	...	Fasting stomach; very small amount of mucus recovered.

TABLE IX.—Hugo A.

	1902		hours	c.c.							mm.*					
1	Nov. 30	Ewald	1	57	Clear	0	++	34	20	74	11	+	R.V.	0	0	
2	Dec. 1	"	1	112	Little food	0	++	40	4	64	9⅓	+	"	0	0	
3	" 1	Asylum dinner	3½	5	" "	0	++	20	...	44	9	+	"	0	0	
4	" 2	Ewald	1	30	Much food	0	++	30	7	57	7.5	+	"	0	0	
5	" 2	Riegel	4	40	Clear	0	++	17	20	60	1	+	"	0	0	
6	" 23	Ewald	1	70	"	0	++	77	12	102	8.5	+	"	0	0	
7	" 24	"	1	36	"	0	++	60	14	84	10.5	+	"	0	0	
8	" 30	"	1	180	"	0	++	67	15	92	10.5	+	"	0	0	
9	Jan. 2	"	1	...	... .	0	++	30	2	40	8	+	"	0	0	Last observation of experimental meal.
10	Dec. 1	Asylum supper	14	15	Few bits toast	...	...	...	...	...	...	...	...	...	...	Fasting stomach; patient was seen eating toast a short time before.

TABLE X.—F. W. C.

	1902		hours	c.c.							mm.*					
1	Nov. 30	Ewald	1	68	Clear	0	++	60	16	90	5	+	R.V.	0	0	
2	Dec. 1	"	1	70	"	0	++	54	26	100	11.5	+	"	0	0	
3	" 1	Asylum dinner	3½	40	Much food	0	++	70	20	100	12.5	+	"	0	0	
4	" 2	Ewald	1	55	Little food	0	++	65	12	90	12 5	+	"	0	0	
5	" 2	Riegel	4	25	Clear	0	++	55	15	75	16	+	"	0	0	
6	" 23	Ewald	1	42	"	...	++	60	10	79	10 5	+	"	0	0	
7	" 24	"	1	28	"	...	++	57	8	76	14	+	"	0	0	
8	" 26	"	70 m.	30	"	...	++	54	7	67	8	+	"	0	0	
9	" 28	"	45 m.	0	"	...	++	35	...	48	8	+	"	0	0	Last observation of experimental meal.
10	" 1	Asylum supper	14 h.	0	....	...	...	...	...	...	...	...	"	0	0	

TABLE XI —Hugh L.

	1902		hours	c.c.							mm.*					
1	Nov. 30	Ewald	1	208	Clear	0	++	50	0	70	3	+	R.V	0	0	
2	Dec. 1	"	1	205	"	0	++	54	0	74	11.75	+	"	0	0	
3	" 1	Asylum dinner	3½	60	Little food	0	++	34	16	70	8 5	+	"	0	0	
4	" 2	Ewald	1	114	Much food	0	++	60	5	75	12.33	+	"	0	0	
5	" 2	Riegel	4	118	Clear	0	++	68	19	98	14	+	A.C.	0	0	Stomach washings before meal perfectly clear.
6	" 23	"	1	350	"	...	++	56	6	70	11	+	R.V.	0	0	
7	" 24	"	1	150	"	...	++	50	8	65	9.5	+	"	0	0	
8	" 26	"	70 m.	150	"	...	++	43	10	55	12	+	"	0	0	
9	" 28	"	1 h.	.....	....	...	++	40	5	56	...	+	"	0	0	Last observation of experimental meal.
10	" 1	Asylum supper	15	0	....	...	...	...	..	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XII.—Geo. K.

	Motility tests.					Acids.					Ferments, etc.					
Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important microorganisms.	Remarks.
	1902		hours	c.c.							mm.*					
1	Dec. 30	Ewald	1	156	Clear	0	++	40	20	80	7	+	R.V.	0	0	
2	Jan. 1	"	1	95	"	0	++	38	19	70	13	+	"	+	0	Suspected tissue bit found, but was accidentally lost.
3	" 1	Asylum dinner	3½	76	Little food	0	+	16	8	32	2	+	"	0	0	Mucus slightly increased.
4	" 2	Ewald	1	90	Clear	0	++	51	7	65	16	+	"	0	0	
5	" 2	Riegel	4	32	"	0	++	90	10	108	14	+	A.C.	0	0	Stomach washings before meal were perfectly clear.
6	" 23	Ewald	1	38	"	...	0	0	2	12	8	+	R.V.	...	...	
7	" 24	"	1	30	"	...	0	0	0	10	6	+	"	...	...	
8	" 26	"	1	52	"	0	0	0	0	12	7	+	"	...	...	
9	Feb. 1	Asylum supper	14	0	....	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

TABLE XIII.—Frank K.

Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important microorganisms.	Remarks.
	1902		hours	c.c.							mm*.					
1	Nov. 30	Ewald	1	35	Clear	0	++	30	14	64	11	+	R.V.	0	0	
2	Dec. 1	"	1	70	"	0	++	27	17	50	12	+	"	0	0	Mucus slightly increased.
3	" 1	Asylum dinner	3½	5	"	0	...	...	...	...	...	...	...	0	0	
4	" 2	Ewald	1	90	Little food	0	+	8	7	27	⅔	+	A.C.	0	0	
5	" 2	Riegel	4	10	Clear	0	+	10	5	25	0	+	M.B.	0	0	
6	" 23	Ewald	1	155	"	...	++	50	11	68	12	+	R.V.	0	0	
7	" 24	"	1	60	"	...	++	71	10	92	9.5	+	"	0	0	
8	" 26	"	1	100	"	...	++	50	14	70	11	+	"	0	0	
9	" 29	"	1	..	....	...	++	52	10	78	8	+	"	0	0	Last observation of experimental meal.
10	" 1	Asylum supper	0	...	....	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XIV.—Hermon O.

			hours	c.c.							hours	min.				
1	1900 Dec. 8	Ewald	1	90	Some bread	0		28	12	50	5	10	M.B.	0	0	
2	1901 Mar. 5	"	1	150	....	0	+	50	18	78	5	10	R.V.	0	0	
3	" 6	"	1	150	....	0	+	62	18	88	...	...	"	0	0	
4	1902 Dec. 1	Asylum breakfast	3.5	50	Clear	0	+	30	6	64	5	+	"	0	0	Bread, butter, potatoes, coffee.
5	" 7	"	2	98	Much bread	+	0	0	15	40	0	+	"	0	0	Hash, gravy, oatmeal, bread, coffee.
6	" 7	Fasting	14	0	....	...	...	...	...	...	...	...	...	0	0	

TABLE XV.—Geo. E. B.

			hours	c.c.							mm.*					
1	1902 Dec. 31	Ewald	1	80	Clear	...	++	62	15	87	14	+	R.V.	...	...	
2	1903 Jan. 1	"	1.5	110	"	...	++	63	14	86	12	+	"	...	...	
3	" 2	"	1	24	"	...	++	36	5	50	12½	+	"	...	...	
4	" 3	"	1	...	....	...	++	62	18	87	...	+	...	...	...	Last observation of experimental test meal.
5	" 3	Asylum supper	15	0	Clear	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XVI.—John V.

			hours	c.c.							hours	min.				
1	1901 April 19	Ewald	1	65	....	0	+	56	18	80	4½	...	R.V.	0	0	Patient became cyanotic; tube withdrawn early; no lavage.
2	" 20	"	1	20	....	...	+	58	16	78	...	10	"	0	0	Patient cyanotic; crying.
3	" 22	"	1	50	....	0	+	38	22	70	4½	8	R.	0	0	" " "
4	" 25	Asylum supper	15	0	....	...	...	...	...	...	...	...	...	0	...	Fasting stomach.
5	" 26	Asylum dinner	4	0	Much food	...	...	...	...	...	...	...	...	...	...	Hard to manage.

TABLE XVII.—Frank S.

Number.	Date.	Motility tests.				Acids.					Ferments, etc.					Remarks.
		Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	
	1901		hours	c.c.							hours	min.				
1	Apr. 19	Ewald	1	8	....	0	++	...	...	...	4	...	R.V.	0	0	Color dark brown; some altered and fresh blood.
2	" 20	"	1¼	1	Few shreds of mucus.	...	...	...	...	...	...	...	...	+	0	Nothing could be obtained after 15 minutes' effort; tissue bit in eye of tube
3	" 22	"	¾	20	"	0	++	40	30	80	3	8	R.V.	0	0	Color brownish; many R.B.Cs.; 1 c.c. used for each test.
4	" 24	Leube	2¾	0	"	...	...	...	...	...	...	...	...	0	...	
5	1902 Jan. 6	Ewald	1	0	Few flakes of bread	...	...	...	...	acid	...	...	...	0	...	
6	" 7	"	1	55	Clean	0	++	64	10	90	3½	10	R.V.	0	0	Few fat globules from supper the evening before.
7	" 8	"	1	3	....	...	faint	...	...	...	...	...	...	0	...	Only a few c.c. of brownish mucus could be obtained
8	" 10	"	1	4	Much bread	...	"	...	...	...	...	...	...	0	...	Nothing could be obtained after 15 minutes' effort until lavage was given.
9	" 11	"	1	75	Practically clean	0	++	46	20	72	3½	...	R.	0	0	
10	" 12	"	1	15	Much bread	...	++	...	...	...	...	...	...	0	...	
11	" 13	Asylum supper	15	0	Clean	...	...	...	...	...	...	...	...	0	...	No test for HCl could be obtained in wash water.
12	" 14	Asylum dinner	2¾	few	....	...	...	...	...	...	...	...	...	0	...	
13	" 18	Riegel	3½	"	Clean	...	...	...	...	...	...	...	...	0	...	
14	July 11	Ewald	1	150	....	0	++	56	28	90	4	...	R.V.	0	...	
15	" 19	"	1	100	....	0	++	54	8	68	+	...	...	0	...	

TABLE XVIII.—Martha Y.

	1900		hours	c.c.							hours	min.				
1	Nov. 6	Ewald	1	20	Clear	...	++	40	41	104	5	...	...	0	0	Ate very little milk before test meal.
2	1901 Feb. 26	"	1	24	....	0	++	50	20	100	2½	10	M.B.	+	0	One small bit mucosa in eye of tube.
3	" 27	"	1	65	Clear	0	++	36	12	72	3	...	R.V.	+	0	One large bit mucosa.
4	Dec. 10	Asylum dinner	3½	0	Small bit carrot	...	...	...	...	...	...	...	...	...	...	Meal of meat and potato stew, carrots, bread pudding; only few flecks of mucus.
5	" 17	Ewald	1	35	Clear	0	++	45	15	75	...	...	...	...	...	Titrations made with 1 c.c.
6	" 18	"	1	30	"	0	++	40	10	50	3½	10	R.V.	+	0	One small bit of mucosa.
7	" 20	"	1	40	"	...	++	70	30	100	4	...	"	0	0	Contents kept over night; froze; no evaporation; two titrations.
8	1902 Jan. 3	"	¾	55	....	0	++	44	6	66	4	5	"	0	0	
9	" 4	"	1	20	Clear	0	++	60	10	70	...	5	"	0	0	Test made with 1 c.c.; repeated.
10	" 5	"	1	45	Few flecks mucus and bread	...	+	48	10	62	3½	...	"	0	0	
11	Feb 19	Asylum dinner	2¾	40	Much	x	0	30	35	90	...	...	...	0	0	Meal of beef, potatoes, bread, milk, cake; very faint reaction with Uffelmann.
12	Jan. 12	Asylum supper	14	0	Few flecks mucus	...	...	...	...	...	...	...	...	0	...	
13	" 14	Asylum dinner	3	much	....	...	0	...	...	...	...	...	...	...	...	
14	May 2	R egel	3.5	20	Few bits meat	0	++	34	...	60	...	...	...	...	...	
15	" 22	Asylum dinner	3	0	"	...	...	...	...	...	...	...	...	...	...	Meal of mac. sup., beef, bread, butter, milk, onions. Fasting stomach examined several times and found empty.

TABLE XIX.—Arthur P.

	1902			c.c.							mm.*					
1	Dec. 30	Ewald	65 m.	170	Clear	...	+	48	12	67	11	+	R.V.	0	0	
2	" 31	"	1 h.	76	"	...	++	45	10	68	11	+	"	0	0	
3	1903 Jan. 1	"	90 m	12	"	...	++	38	3	55	12	+	"	0	0	
4	" 1	Asylum supper	15 h.	0	"	...	...	...	...	...	...	..	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XX.—Wilhelmina D.

	Motility tests.					Acids.					Ferments, etc.					
Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg.	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c c.							hours	min.				
1	Jan. 16	Ewald	1	130	Few small bits bread.	0	+	42	28	72	4	5	R.	0	0	
2	“ 17	“	1	145	Nothing	0	+	40	18	68	4½	5	R.V.	0	0	
3	Feb. 15	“	1	150	“	0	+	38	26	70	3	5	“	0	0	Ate 10 gms. more bread than before.

TABLE XXI.—Harrington W.

Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg.	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c.c.							mm.*	min.				
1	Nov. 30	Ewald	1	0	Clear	...	...	...	...	...	...	...	...	0	0	
2	Dec. 1	“	1	8	“	...	0	0	0	8	0	0	R.V.	0	0	
3	“ 1	Asylum dinner	3	3	“	0	0	0	...	...	0	0	...	0	0	
4	“ 2	Ewald	1	5	“	0	0	0	0	0	...	...	R.V.	0	0	
5	“ 2	Riegel	3	0	“	0	0	0	0	0	0	0	0	0	0	
6	“ 1	Asylum supper	14	0	“	...	...	...	...	...	...	...	...	0	0	Fasting stomach.

TABLE XXII.—W. E. G.

Number.	Date.	Meal employed.	Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg.	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c.c.							mm.*	min.				
1	Nov. 30	Ewald	1	34	Clear	0	0	0	0	2	0	0	R.V.	0	0	Excessive mucus.
2	Dec. 1	“	1	46	“	0	0	0	0	2	0	0	“	0	0	“ “
3	“ 1	Asylum dinner	3.5	68	“	0	0	0	0	10	0	0	“	0	0	“ “
4	“ 2	Ewald	1	82	“	0	0	0	0	15	0	0	“	0	0	“ “
5	“ 2	Riegel	4	10	“	0	0	0	0	10	0	0	A.C.	0	0	Mucus normal; stomach washings before [meal perfectly clear.
6	“ 1	Asylum supper	14	0	“	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

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* Peptic value, Mett's method.

Case III.—Harrington W. (see Table XXI.), aged sixty-three years, widower, American, farmer. No insanity in family. Admitted to asylum October, 1896. In the spring of 1896 patient complained of indefinite symptoms on the part of his stomach. He began to worry about financial affairs and about his health. He was hypochondriacal and thought himself unable to work. Delusions of health continued. In April, 1897, he thought his bowels did not move and that this was due to a growth occluding the passage. He begged for an operation. He refused to eat, wanted to starve himself. Forced feeding had to be instituted. He was markedly depressed. November 1, 1899, he attempted suicide. October 15, 1900, second suicidal attempt. Bowels regular.

Patient is well nourished.

Blood: Red cells, 4,000,000; hæmoglobin, 70 per cent.; white cells, 5490.

Urine: Negative.

Weights: 1897, 170 pounds; January, 1902, 193 pounds; April, 187 pounds; June, 200 pounds; August, 196 pounds; November, 184 pounds.

Case IV.—W. E. G. (see Table XXII.), aged forty-eight years, married, American, occupation unknown. Previous to his mental trouble patient was always of a cheerful disposition, quiet, and talked but little about his business.

In August, 1901, he began to cry; little other change was observed; several weeks after this he became much worried about the wood, and thought he and his family would freeze to death. Insomnia developed. His appetite was fair, but at times he believed something was wrong with his food. At one time he attempted to jump out of a window, as he thought the house was on fire.

Patient was admitted to the asylum March 10, 1902. He was very much depressed; he answered questions with great reluctance. He had hallucinations of hearing; would stop and listen to imaginary voices. He became very apprehensive, believed that other inmates composed an army brought to the institution to kill him. He was restless, constantly moving about the ward. His condition continued the same until May 29, 1902, when he was taken to his home for a visit. While there he secured a revolver and shot himself.

Physical examination entirely negative.

Stomach in normal position.

Conclusions. 1. In states of mental depression (melancholia) hyperacidity is the rule, occurring in 71.4 per cent. of von Noorden's 14 cases, 81.8 per cent. of our 22 cases, or in 77.7 per cent. of all cases (36 in number). Males and females are equally affected.

2. This hyperacidity is due to a true hyperchlorhydria. Hypertotal acidity also occurred in our cases, and in this respect they correspond exactly with those reported by von Noorden.

3. The hyperchlorhydria is of moderate degree, is fairly constant, and is associated with increased peptic power and rapid evacuation.

4. The increased secretion is due to the neurosis or psychosis and not to proliferative changes in the glands, as is evidenced by the presence of increased secretion associated with degenerative changes in the glandular elements, and of the entire mucosa.

5. The evacuation of the stomach is usually normal or somewhat hastened after the Ewald test breakfast, while after the large stimulus of the Riegel meal and ordinary Asylum meal it is more frequently hastened.

6. In the cases showing hyperchlorhydria the peptic value is never below normal and is frequently increased.

7. Many of the insane are suffering from various forms of gastro-intestinal disease. These conditions are very frequently overlooked, probably because complaints and delusions of the digestive tracts are so common in these patients. Our experience and the results of this investigation prompts us to urge the absolute necessity for systematic routine examinations of all the secretions and functions, of the body including what is often a very difficult task, the examination of the stomach contents. The signs of disease in the insane are almost wholly objective, and here more than in normal mental states it is essential that every modern method of value should be exhausted in order to arrive at a complete diagnosis of the case. Cancer and ulcer of the stomach may thus often be recognized in its incipiency. Chronic gastritis in its several forms, as well as the painful neuroses, will also often be encountered. If proper treatment be instituted it is not at all improbable that the mental symptoms in these cases will proportionately decrease.

SOME REMARKS ON THE NATURE AND CLASSIFICATION OF INSANITY.[1]

By Theodore Diller, M.D.,
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The ancient truism that a sound mind results from a sound body implies that the mind is not sound when the body is diseased. An unsound body may be expected to produce symptoms and physical signs by which its diseased condition may be recognized. Among the manifestations of the diseased body are those symptoms which are called mental. But mental symptoms are seldom or never the sole manifestations of bodily disease. Yet they are often so conspicuous as to dominate the clinical picture and lead us to lose sight

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[1] A paper read before the Annual Meeting of the American Neurological Society held at St. Louis, September 17, 1904.